Trans-Lake Washington Project

REVISED DRAFT
Noise Walls and Lids Case Studies Summary

Preliminary Assessment of the Effectiveness of Noise Mitigation Strategies in the SR 520 Corridor

Prepared for

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1. INTRODUCTION / PURPOSE

A preliminary noise mitigation and design options case study was performed in three areas along the SR520 project corridor. The purpose of the study was to determine, the overall effectiveness of various lid lengths/noise wall combinations in reducing noise levels, and what additional supplemental noise mitigation would be required with different lid options. Three main areas were studied; the SR520 to I-5 interchange area, the Montlake area and SR520 between 80th and 96th Ave NE. Five different lid/noise wall configurations were explored, and plans for each are included in this report together with an analysis on the effectiveness of each combination.

2. MODELING PARAMETERS

Traffic noise levels were projected using the FHWA TNM noise model for the existing conditions; future build conditions (6-lane build) with no design options or mitigation measures, and future conditions with different design and mitigation options and combinations. Input to the noise model includes traffic volumes, speed and mixture (cars, medium trucks and heavy trucks). For the noise study at I-5 to SR520 and Montlake, no arterial or collector roads were used in the model. The decision not to include the arterial and collector roads in these sections was made in order to obtain a clearer understanding of the different noise characteristics in relation to the changes in the highway itself. For the 84th Ave NE noise study, NE 24th Street was included in the model to better represent the overall noise levels, and to provide an understanding of the actual future noise levels.

Two different lid design options were considered for the I-5 to SR520 interchange, and both were considered with and without supplemental noise mitigation. Both design options provide for an expanded overpass to replace the Roanoke I-5 over crossing. Option 1 also includes an expanded lid section which connects 10th Ave E to the Roanoke overpass. Option 2, while including the I-5 lid section, provides for another lid section that includes 10th Ave E to Delmar Drive. Under Option 2, the section of the lid from 10th Ave to the I-5 lid is eliminated. In the Montlake area, a 500 foot lid was modeled both with and without supplemental noise mitigation. The lid begins just west of Montlake Blvd. and extends to 100 feet west of 24th Ave E. Mitigation and design options considered for the 84th Ave NE noise analysis includes noise walls, an expanded 300-foot overpass at 84th Ave NE supplemented with noise walls, and a 1350-foot lid, also supplemented with noise walls.

For the I-5 to SR520 and Montlake area noise study, 12 representative receivers were selected. Each receiver location was modeled at heights of 5, 15, and 21 feet above the ground to provide an understanding of how well the project design would accommodate noise reductions for upper floor residential areas. This resulted in a total of 36 receivers for this section of the study.

In the 84th Ave NE area, thirty-two noise sensitive properties were selected as representative receivers for the modeling. All receivers in this segment were modeled at the WSDOT standard height of 5-feet above the ground at the specific receiver location. Fifteen receivers are along the north side of SR520 and 17 receivers are along the south side of SR520.

Figures 1 through 5 contain aerial views of the study area, including I-5, SR520, major roadways, expanded overpasses, lids, and receiver locations used in the analysis.

3. ANALYSIS SUMMARY

Overall, the results of the analysis show that noise walls are well suited at reducing noise levels throughout the project corridor. A combination of the proposed design options and noise mitigation are effective at reducing the overall noise levels and virtually eliminating all noise impacts, (as determined by the WSDOT 66 dBA peak-hour Leq threshold) related to SR520 and I-5. The following sections contain a brief review of existing and future noise levels with the deign options and noise mitigation. Also, three Tables are provided at the end of the report that contain complete results of the noise analysis for each of the project areas.

I-5 – SR520 Interchange and Montlake

Existing Conditions: Existing conditions in the area near the I-5 to SR520 interchange ranged from 62 to 76 dBA at 5 feet, with maximum levels of up to 77 dBA at the 21 foot elevation. The highest noise levels were modeled along Boylston Ave. (receivers R-5 to R-7) where I-5 is the main noise source. Noise levels in the area bounded by Harvard and Roanoke (receivers R-1 to R-4) ranged from 61 to 65 dBA, and receivers along the south side of SR520 (R-8 and R-9), east of I-5 ranged from 65 to 66 dBA. Existing noise levels at the receivers in Montlake range from 61 to 67 dBA at 5 feet, increasing to 64 to 70 at 21 feet.

Future Build Conditions with Lid Option 1 (I-5 – SR520 Interchange)**:** Under Lid Option 1, noise levels are reduced by up to 9 dBA L_{eq} at select receivers located near the center of the lid. The maximum reduction was obtained at receiver R-7 along Boylston Ave. Reductions of up to 6 dBA were modeled in the Roanoke – Harvard area. Receivers located near the endpoints of the lid had little or no noise reduction. Three of the 14 locations still exceed the 66 dBA criteria at 5 feet, and six locations had levels at, or above 66 dBA at 21 feet.

Future Build Conditions with Lid Option 2 (I-5 – SR520 Interchange)**:** Under lid option 2, noise levels are also reduced by up to 9 dBA L_{eq} at select receivers located near the centers of the lid. As with lid 1, the maximum reduction was obtained at receiver R-7 along Boylston Ave. Reductions of up to 5 dBA were modeled in the Roanoke – Harvard area. Receivers located near the endpoints of the lid had little or no noise reduction.

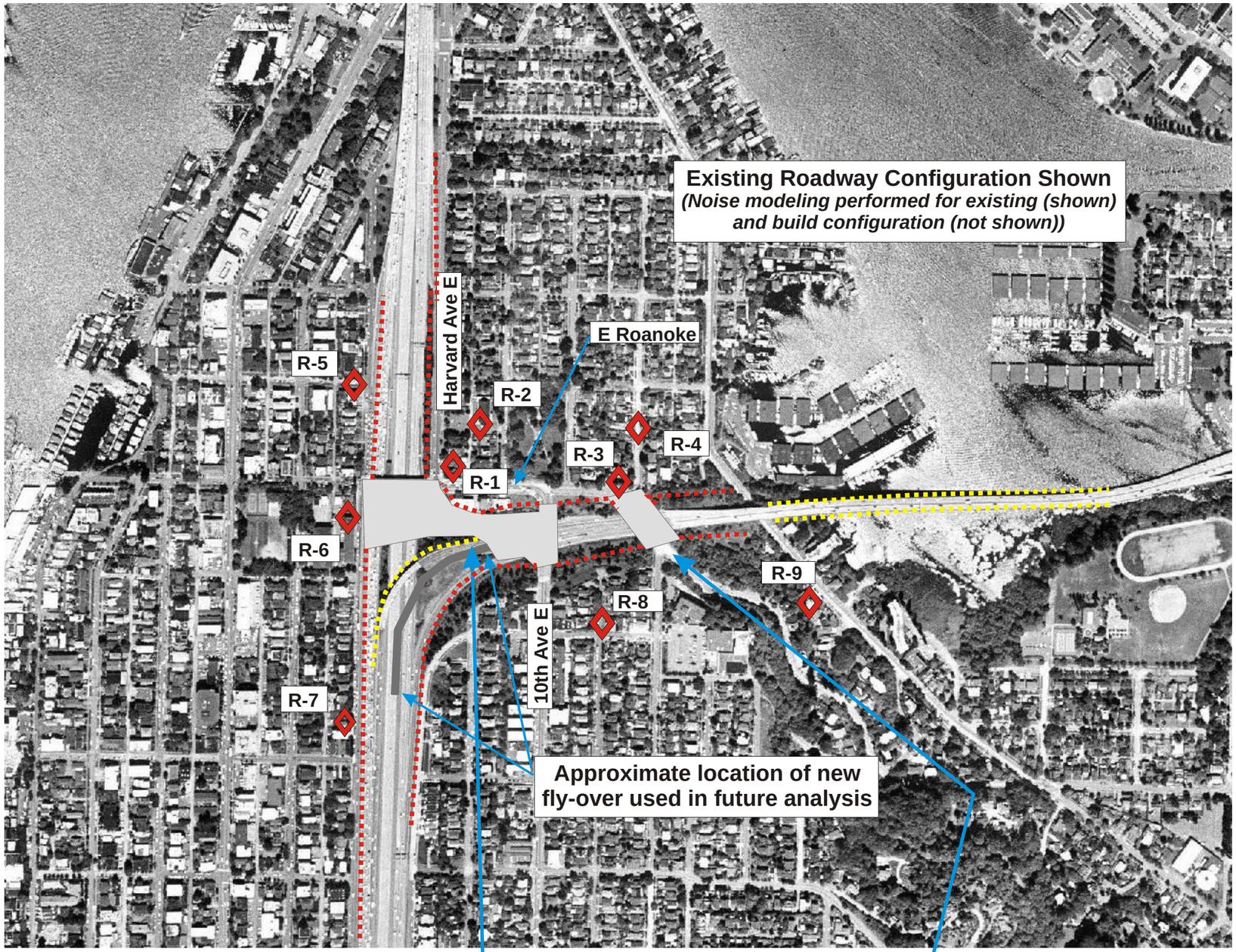
Future Build Conditions with Lid (Montlake Area): Noise levels would be reduced by 1 to 3 dBA at receivers in the Montlake area. The highest reductions would be at receivers located near the highway, which have the highest existing and future noise level projections. As with the lids in other areas, there is little additional benefit for receivers located near the lid endpoints.

Future Build Conditions with Lid Options 1 and Noise Walls (I-5 – SR520 Interchange)**:** With the addition of noise walls to supplement the lids, noise reductions of 15 dBA over the existing condition noise levels were modeled. Noise walls used in the modeling are shown on Figures 1 through 3, and include 14 foot walls in all areas except along Boylston Ave. where a wall height of 16 feet was used. In addition, the noise walls on elevated structures and bridges were noise absorbing walls with a height of 8 feet above the roadway. Under this option, all receivers were below the WSDOT 66 dBA impact criteria at all elevations. Overall, future noise levels near I-5 to SR520 ranged from 55 dBA to 61 dBA at the 5 foot elevation, increasing to a

maximum of 65 dBA at the 21 foot elevation at receiver R-5.

Future Build Conditions with Lid Option 2 and Noise Walls (I-5 – SR520 Interchange)**:** Under Lid Option 2 with the same noise walls described under Lid Option 1, all receivers are also below the 66 dBA criteria at all elevations. Overall, future noise levels near I-5 to SR520 ranged from 55 dBA to 61 dBA at the 5 foot elevation, increasing to a maximum of 65 dBA at the 21 foot elevation, also at receiver R-5.

Future Build Conditions with Lid and Noise Walls (Montlake Area): Noise levels in the Montlake area ranged from 55 to 57 dBA at 5 feet, increasing to 60 dBA at 21 feet. All receivers were below the WSDOT 66 dBA impact criteria at all elevations.



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Receiver Modeling Location
(R-1 through R-44)

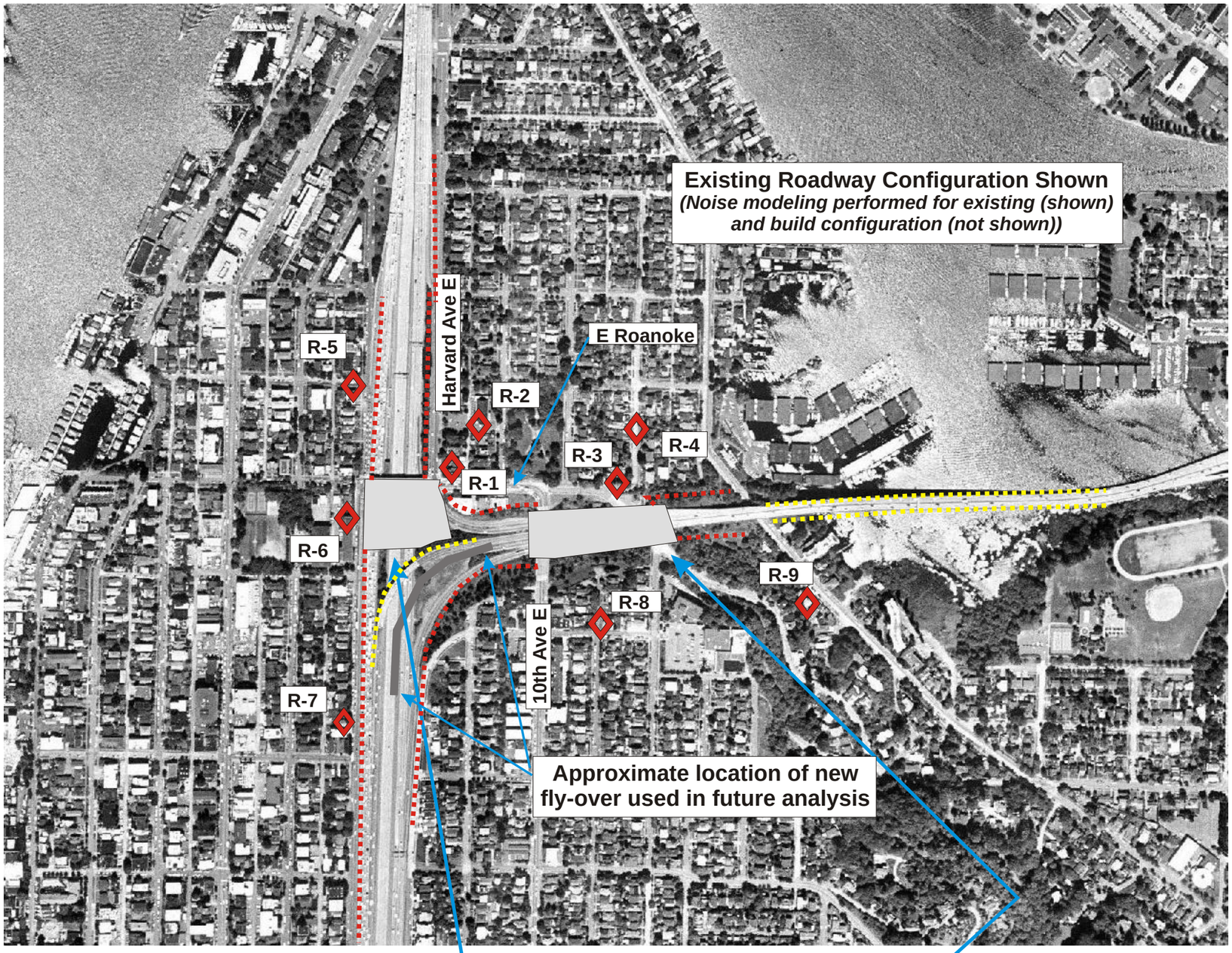
Standard Noise Wall Location
(12 to 16 feet height)

Absorptive Noise Wall Location
(8 feet high)

I-5 to SR-520 Lid Option 1
Lid Roanoke to 10th
Expanded Overpass at Delmar Dr

N

Figure 1 of 5
Noise Modeling Locations
Trans-Lake Project
Eastlake, Roanoke and Capital Hill



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Washington State Department of Transportation
Sound Transit

Receiver Modeling Location
(R-1 through R-44)

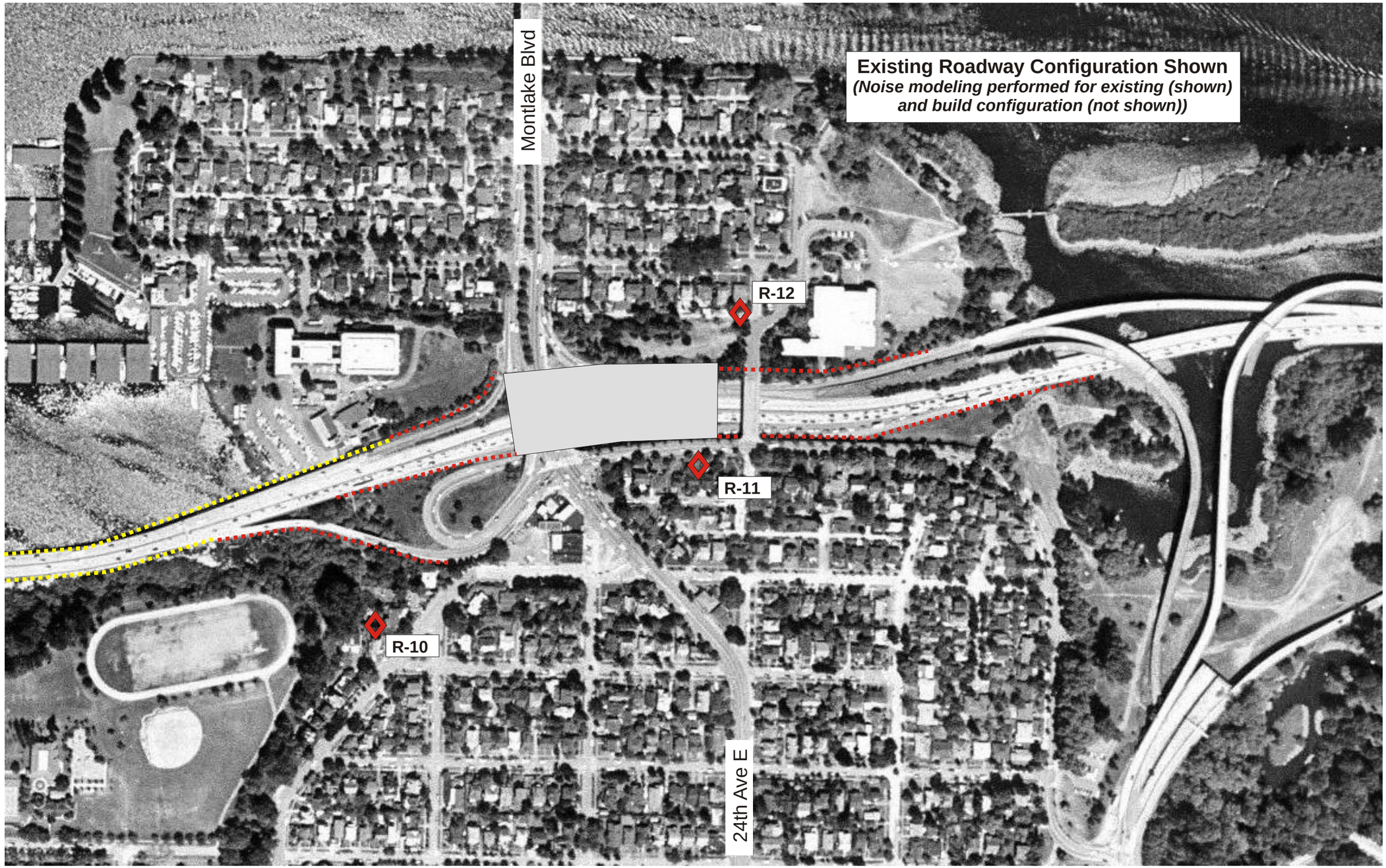
Standard Noise Wall Location
(12 to 16 feet height)

Absorptive Noise Wall Location
(8 feet high)

I-5 to SR-520 Lid Option 2
Lid 10th to Delmar Dr
Expanded Overpass at Roanoke

N

Figure 2 of 5
Noise Modeling Locations
Trans-Lake Project
Eastlake, Roanoke and Capital Hill



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Receiver Modeling Location
(R-1 through R-44)

Standard Noise Wall Location
(12 to 16 feet height)

Absorptive Noise Wall Location
(8 feet high)

Montlake Lid Option

N

Figure 3 of 5
Noise Modeling Locations
Trans-Lake Project
Montlake Area

Summary – I-5 to SR520 and Montlake: Adding noise walls to a combination of lids and expanded overpasses, it is possible to achieve significant reductions in noise levels throughout this segment of the study area. The modeled noise levels show that virtually all receivers in this segment of the project corridor could have substantial noise reductions with a combined design option and noise mitigation. This combination could result in a reduction of noise levels below that experienced today, and below the threshold criteria requiring additional mitigation considerations.

There was no discernable difference between the two lid options. Under Lid Option 1 noise levels were slightly lower, by only 1 dBA at receiver R3, and slightly higher, by 0 to 0.5 dBA at receivers 1 and 2. Lid Option 1 also produced insignificant reduction at receivers R-6 and R-8. (As a note, a 3 dBA change in traffic noise levels is normally required before the average human will detect a change in noise levels.) Because all of the differences are less that 1.2 dBA, there should be no audible difference between the two lid options with noise mitigation. In addition, any additional reduction at the receivers noted could most likely be achieved using slightly higher noise walls.

Tables 1 and 2 provide a general summary of the existing noise levels, noise levels with the lid options, and noise levels with the lids and noise walls for the two lid options. Also included is an overall reduction for each elevation studied in this segment of the project corridor. Detailed noise levels for all modeling are given in Tables 4 and 5 at the end of this report, with the receivers, lids and noise walls used in the modeling shown on Figure 1 through 3.

Table 1

Noise Level Summary Lid Option 1: I-5 to SR520 and Montlake Areas

(all noise level in dBA L_{eq} [1])

Location	Elevation[2]	Existing[3]	Future w/Lid[4]	Future w/Lid + Walls[5]	Reduction[6]
I-5 - SR520	Minimum @ 5 ft	61.6	57.1	55.4	-15.4
I-5 - SR520	Maximum @ 5 ft	**76.0**	**72.0**	61.4	-4.9
Montlake	Minimum @ 5 ft	61.3	60.4	55.3	-9.9
Montlake	Maximum @ 5 ft	**66.9**	63.7	57.0	-6.0
I-5 - SR520	Minimum @ 15 ft	63.4	59.2	57.5	-14.6
I-5 - SR520	Maximum @ 15 ft	**76.8**	**74.3**	63.8	-4.9
Montlake	Minimum @ 15 ft	62.6	62.6	57.2	-9.9
Montlake	Maximum @ 15 ft	**69.3**	**66.3**	59.4	-5.4
I-5 - SR520	Minimum @ 21 ft	64.0	60.2	58.2	-12.8
I-5 - SR520	Maximum @ 21 ft	**77.1**	**75.1**	64.9	-4.9
Montlake	Minimum @ 21 ft	63.8	63.7	58.1	-9.2
Montlake	Maximum @ 21 ft	**69.7**	**67.1**	60.5	-5.7
Overall Noise Level Comparison[7]					
	Minimum	***61.3***	***57.1***	***55.3***	***-15.4***
	Maximum	***77.1***	***75.1***	***64.9***	***-4.9***
	Average	***68.3***	***64.8***	***59.5***	***-8.7***

1. Noise levels in bold exceed the WSDOT noise impact criteria
2. Elevation above ground at each receiver location
3. Existing noise levels projected using existing traffic volumes and speeds
4. Future build noise levels using the 6-lane alternative with lid option 1
5. Future build noise levels using the 6-lane alternative with lid option 1 and noise walls
6. Reduction in noise levels: existing to build with lid option 1 and noise walls
7. Overall comparison at all three elevations

84th Ave NE Noise Analysis Summary

Existing Conditions: Existing noise levels in the project area ranged from 61 to 72 dBA during peak traffic noise hours (2 pm to 3 pm from measured noise data). Sixteen of the 32 receivers locations used in the noise modeling are projected to exceed the WSDOT noise impact criteria. The 16 receivers represent approximately 30 to 35 residential structures that are expected to exceed the noise impact criteria. Most of the identified noise impacts are located adjacent to SR520. Residents located farther away from the highway (greater than 175 feet) are projected to have noise levels ranging from 61 to 65 dBA.

Future Build Conditions without Mitigation or Design Options: Noise levels are projected to increase by 1 to 4 dBA throughout the project area. The average increase for all receivers used in the modeling was approximately 1.5 dBA. Under the future conditions, approximately six additional receivers on the south side of SR520 were identified which would qualify for mitigation.. No additional noise receivers at levels requiring mitigation were identified on the north side of the highway.

Table 2
Noise Level Summary Lid Option 2: I-5 to SR520 and Montlake Areas
(all noise level in dBA L_{eq} [1])

Location	Elevation[2]	Existing[3]	Future w/Lid[4]	Future w/Lid + Walls[5]	Reduction[6]
I-5 - SR520	Minimum @ 5 ft	61.6	57.3	55.4	-15.4
I-5 - SR520	Maximum @ 5 ft	**76.0**	**72.0**	61.4	-5.3
Montlake	Minimum @ 5 ft	61.3	60.4	55.3	-9.9
Montlake	Maximum @ 5 ft	**66.9**	63.7	57.0	-6.0
I-5 - SR520	Minimum @ 15 ft	63.4	60.0	58.4	-14.6
I-5 - SR520	Maximum @ 15 ft	**76.8**	**74.3**	63.8	-5.0
Montlake	Minimum @ 15 ft	62.6	62.6	57.2	-9.9
Montlake	Maximum @ 15 ft	**69.3**	**66.3**	59.4	-5.4
I-5 - SR520	Minimum @ 21 ft	64.0	60.5	59.0	-12.6
I-5 - SR520	Maximum @ 21 ft	**77.1**	**75.1**	64.9	-5.0
Montlake	Minimum @ 21 ft	63.8	63.7	58.1	-9.2
Montlake	Maximum @ 21 ft	**69.7**	**67.1**	60.5	-5.7
Overall Noise Level Comparison[7]					
	Minimum	***61.3***	***57.3***	***55.3***	***-15.4***
	Maximum	***77.1***	***75.1***	***64.9***	***-5.0***
	Average	***68.3***	***65.0***	***59.6***	***-8.7***

1. Noise levels in bold exceed the WSDOT noise impact criteria
2. Elevation above ground at each receiver location
3. Existing noise levels projected using existing traffic volumes and speeds
4. Future build noise levels using the 6-lane alternative with lid option 2
5. Future build noise levels using the 6-lane alternative with lid option 2and noise walls
6. Reduction in noise levels: existing to build with lid option 2 and noise walls
7. Overall comparison at all three elevations

Mitigation and Design Options Considered: At a minimum, noise mitigation measures considered for the project include noise walls along both sides of the roadway. The modeled barriers would be approximately 12 feet high, and extend throughout the entire residential area. In addition to the noise walls, two expanded lid options were also examined for inclusion with the project. A 300-foot expanded overpass for 84th Ave NE was examined with noise walls to

provide supplemental mitigation and a 1350-foot lidded section of highway, again with noise walls to supplement noise mitigation.

Future Build Conditions with Noise Walls Only: Noise walls were effective at reducing noise level throughout the project area by up to 13 dBA. All noise impacts except R19 would be eliminated with the noise walls as mitigation. Future noise levels with the mitigation are projected at 54 to 67 dBA L_{eq}. For receivers located outside the modeled locations, further south up Clyde Hill, only a minimal reduction, if any, can be expected. Because of the increased distance, however, noise levels at these locations are projected to be below the WSDOT criteria and are also projected to remain at approximately the same noise levels experienced today.

Future Build Conditions with Expanded Overpass and Noise Walls: The combined expanded overpass with supplemental noise walls was no more effective at eliminating noise impacts. Noise level reductions of up 13 dBA are projected with this combined mitigation and design option. Future noise levels under this analysis also ranged from 54 to 67 dBA L_{eq}. The expanded overpass is not projected to result in any benefit for receivers located south of the study area, up Clyde Hill.

Future Build Conditions with Lidded Highway and Noise Walls: The combined lidded highway with supplemental noise walls was minimally more effective at eliminating all impacts, including receiver R-19. Noise level reductions of up 15 dBA are projected with this combined mitigation and design option. Future noise levels under this analysis also ranged from 53 to 63 dBA L_{eq}. Some residents directly south of R-37 may receive a slight benefit from this lid option. However, the benefit would likely be less than the 3 dBA that is normally required for human perception when compared to noise wall alone. Other receivers located south of the study area, and east or west of the lid endpoints, may receive a slight increase in noise when compared to noise walls alone due to reflections from the lid openings. It is expected, however, that with slightly higher noise walls, the actual noise levels in those areas with reflected noise could be reduced to the same as without the reflections.

Existing Roadway Configuration Shown
(Noise modeling performed for existing (shown) and build configuration (not shown))

R-13
R-14
R-15
R-16
R-17
R-18
R-19
R-20
R-21
R-22
R-23
R-24
R-25
R-26
R-27
R-28
R-29
R-30
R-31
R-32
R-33
R-34
R-35
R-36
R-37
R-38
R-39
R-40
R-41
R-42
R-43
R-44

84th Ave NE
84th Ave NE
NE 28th

Receiver Modeling Location
(R-1 through R-44)

Standard Noise Wall Location
(12 to 16 feet height)

Absorptive Noise Wall Location
(8 feet high)

84th Avenue NE Option 2
300 foot Expanded Overpass

N

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Figure 4 of 5
Noise Modeling Locations
Trans-Lake Project
84th Avenue NE

Existing Roadway Configuration Shown
(Noise modeling performed for existing (shown) and build configuration (not shown))

R-15
R-13
R-17
R-27
R-16
R-18
R-14
R-22
R-20
84th Ave NE
R-24
R-26
R-19
R-44
R-25
R-23
R-21
R-43
R-40
R-41
R-38
NE 28th
R-29
R-36
R-42
R-30
R-32
R-34
R-39
R-28
R-37
R-31
R-33
R-35
84th Ave NE

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Receiver Modeling Location
(R-1 through R-44)

Standard Noise Wall Location
(12 to 16 feet height)

Absorptive Noise Wall Location
(8 feet high)

84th Avenue NE Option 2
1350 foot Lid

N

Figure 5 of 5
Noise Modeling Locations
Trans-Lake Project
84th Avenue NE

84th Ave NE Noise Mitigation and Design Options Summary:

Table 3 provides a general comparison between noise levels of the three-modeled alternatives. The table lists an overall noise reduction comparison with and without noise abatement and noise abatement combined with design options.

Table 3:
Noise Level Reduction Summary and Comparison of Mitigation and Design Options

Change	Overall Noise Reduction: Build Conditions without Abatement vs. with Abatement[1]			Comparison of Walls Only with Combined Design + Mitigation Measures[2]	
	Noise Walls Only	Overpass W/ Walls	Lidded Highway w/Walls	Expanded Overpass vs. Walls	Lidded Highway vs. Walls
Minimum	2.0	2.0	3.5	0.0	0.2
Maximum	14.3	14.6	16.7	0.6	4.1
Average	8.0	8.2	9.6	0.2	1.6

1. These columns provide an overall comparison of the noise level reduction when compared to the existing noise levels for all 32-receiver locations. Presented is the maximum, minimum and average noise reduction under the three different mitigation and design + mitigation options described above.

2. These two columns provide a comparison of the effectiveness of the design options + mitigation versus just applying noise mitigation.

- All noise abatement measures explored in this analysis are effective at reducing the noise levels and noise impacts throughout the area. One receiver, R-19, could still exceed the FHWA criteria, (dBA 66 dBA Peak-hour Leq) except under the lidded option. With further analysis, to be performed during the EIS, it is likely that this impact could also be eliminated with noise walls only, or the combined expended overpass and noise wall supplements.

- Overall noise reductions in the project area are similar under all the mitigation and mitigation + design options explored. The difference in average noise reduction between the mitigation and mitigation + design options at all area receivers is less than 2dBA. The average human can only discern a 3-dBA change in traffic noise levels.

- The expanded overpass with noise walls would provide an average 0.2 dBA reduction when compared to the noise wall only options.

- The 1350 foot lidded section would eliminate one additional impact (R-19) while only providing an average 1.6 dBA additional reduction in noise when compared to the noise wall only option.

- The locations that would receive the most benefit from the 1350 foot lid are receivers R-19, R-20, R-22 R-40. Three of these receivers, R-19, R-20 and R-22, are located along 84th Ave NE, and therefore would still have significant noise from local area traffic. In addition, the three receivers would only receive a 3 to 4 dBA additional reduction when compared to the other two mitigation and mitigation + design options. Receiver R-40 would also benefit by an additional 3 dBA reduction. However, it may be possible to

achieve increased noise level reductions at all receivers and provide mitigation for R-19 with additional modeling and analysis.

- Detailed noise levels for all monitoring in the 84th Ave NE area are included in Table 6 at the end of this report.

In conclusion, the area in question surrounding 84th Ave NE is well suited for noise wall mitigation measures. Lidding in combination with noise walls may not yield any noticeable reduction in noise levels when compared with noise walls alone.

Table 4
Peak-Hour Leq Noise Level Comparison Analysis
Roanoke - Harvard - Eastlake - Capitol Hill - Montlake Areas
Lid Version 1 - 35 MPH Maximum Through-Put Traffic Volume Comparison

Draft Noise Results:

Peak Hour Leq Noise Levels with Impacts for Leq >= 66 dBA or 10 dBA increase)

		Existing	Year 2020 Analysis			Noise Level Comparisons		
Receiver	Receiver	Conditions	w/Lid	w/Lid + Walls		Bld w/Lid	Bld w/Lid + Walls	Bld w/Lid + Walls
Number	Elevation	@ 35 MPH	@ 35 MPH	@ 35 MPH		- Existing	- Existing	- Bld w/Lid Only
R1	5	65.3	64.4	58.7		-0.9	-6.6	-5.7
	15	69.8	68.1	61.6		-1.7	-8.2	-6.5
	21	71.8	69.8	63.9		-2.0	-7.9	-5.9
R2	5	62.8	61.7	57.9		-1.1	-4.9	-3.8
	15	64.8	64.7	59.9		-0.1	-4.9	-4.8
	21	66.0	66.0	61.1		0.0	-4.9	-4.9
R3	5	63.4	57.9	56.1		-5.5	-7.3	-1.8
	15	64.9	59.2	57.5		-5.7	-7.4	-1.7
	21	65.3	60.2	58.2		-5.1	-7.1	-2.0
R4	5	61.6	57.1	55.4		-4.5	-6.2	-1.7
	15	63.4	60.1	58.5		-3.3	-4.9	-1.6
	21	64.0	60.6	59.1		-3.4	-4.9	-1.5
R5	5	72.6	72.0	61.4		-0.6	-11.2	-10.6
	15	75.0	74.3	63.8		-0.7	-11.2	-10.5
	21	75.6	75.1	64.9		-0.5	-10.7	-10.2
R6	5	74.5	66.6	59.1		-7.9	-15.4	-7.5
	15	75.8	69.2	61.3		-6.6	-14.5	-7.9
	21	76.1	70.1	63.3		-6.0	-12.8	-6.8
R7	5	76.0	67.4	60.6		-8.6	-15.4	-6.8
	15	76.8	71.2	62.2		-5.6	-14.6	-9.0
	21	77.1	73.2	64.5		-3.9	-12.6	-8.7
R8	5	64.5	58.8	57.0		-5.7	-7.5	-1.8
	15	67.1	60.5	58.3		-6.6	-8.8	-2.2
	21	67.5	61.2	58.8		-6.3	-8.7	-2.4
R9	5	65.9	60.8	57.2		-5.1	-8.7	-3.6
	15	66.5	63.8	59.9		-2.7	-6.6	-3.9
	21	66.9	63.8	59.7		-3.1	-7.2	-4.1
R10	5	61.3	60.4	55.3		-0.9	-6.0	-5.1
	15	62.6	62.6	57.2		0.0	-5.4	-5.4
	21	63.8	63.7	58.1		-0.1	-5.7	-5.6
R11	5	66.9	62.8	57.0		-4.1	-9.9	-5.8
	15	69.3	64.9	59.4		-4.4	-9.9	-5.5
	21	69.7	65.1	60.5		-4.6	-9.2	-4.6
R12	5	66.0	63.7	56.1		-2.3	-9.9	-7.6
	15	67.8	66.3	59.2		-1.5	-8.6	-7.1
	21	68.8	67.1	60.4		-1.7	-8.4	-6.7

Noise Level Summary

Minimum	***61.3***	***57.1***	***55.3***		***-8.6***	***-15.4***	***-10.6***
Maximum	***77.1***	***75.1***	***64.9***		***0.0***	***-4.9***	***-1.5***
Average	***68.3***	***64.8***	***59.5***		***-3.4***	***-8.7***	***-5.3***

Table 5
Peak-Hour Leq Noise Level Comparison Analysis
Roanoke - Harvard - Eastlake - Capitol Hill - Montlake Areas
Lid Version 2 - 35 MPH Maximum Through-Put Traffic Volume Comparison

Draft Noise Results:

Peak Hour Leq Noise Levels with Impacts for Leq >= 66 dBA or 10 dBA increase)

		Existing	Year 2020 Analysis			Noise Level Comparisons		
Receiver	Receiver	Conditions	w/Lid	w/Lid + Walls		Bld w/Lid	Bld w/Lid + Walls	Bld w/Lid + Walls
Number	Elevation	@ 35 MPH	@ 35 MPH	@ 35 MPH		- Existing	- Existing	- Bld w/Lid Only
R1	5	65.3	64.6	58.4		-0.7	-6.9	-6.2
	15	69.8	68.3	61.3		-1.5	-8.5	-7.0
	21	71.8	69.9	63.7		-1.9	-8.1	-6.2
R2	5	62.8	62.1	57.5		-0.7	-5.3	-4.6
	15	64.8	64.7	59.4		-0.1	-5.4	-5.3
	21	66.0	66.0	60.6		0.0	-5.4	-5.4
R3	5	63.4	58.8	57.2		-4.6	-6.2	-1.6
	15	64.9	60.2	58.6		-4.7	-6.3	-1.6
	21	65.3	61.2	59.4		-4.1	-5.9	-1.8
R4	5	61.6	57.3	55.4		-4.3	-6.2	-1.9
	15	63.4	60.0	58.4		-3.4	-5.0	-1.6
	21	64.0	60.5	59.0		-3.5	-5.0	-1.5
R5	5	72.6	72.0	61.4		-0.6	-11.2	-10.6
	15	75.0	74.3	63.8		-0.7	-11.2	-10.5
	21	75.6	75.1	64.9		-0.5	-10.7	-10.2
R6	5	74.5	66.7	59.2		-7.8	-15.3	-7.5
	15	75.8	69.3	61.4		-6.5	-14.4	-7.9
	21	76.1	70.2	63.6		-5.9	-12.5	-6.6
R7	5	76.0	67.4	60.6		-8.6	-15.4	-6.8
	15	76.8	71.2	62.2		-5.6	-14.6	-9.0
	21	77.1	73.2	64.5		-3.9	-12.6	-8.7
R8	5	64.5	60.0	57.1		-4.5	-7.4	-2.9
	15	67.1	61.4	58.5		-5.7	-8.6	-2.9
	21	67.5	62.1	59.2		-5.4	-8.3	-2.9
R9	5	65.9	60.8	57.2		-5.1	-8.7	-3.6
	15	66.5	63.8	59.9		-2.7	-6.6	-3.9
	21	66.9	63.8	59.7		-3.1	-7.2	-4.1
R10	5	61.3	60.4	55.3		-0.9	-6.0	-5.1
	15	62.6	62.6	57.2		0.0	-5.4	-5.4
	21	63.8	63.7	58.1		-0.1	-5.7	-5.6
R11	5	66.9	62.8	57.0		-4.1	-9.9	-5.8
	15	69.3	64.9	59.4		-4.4	-9.9	-5.5
	21	69.7	65.1	60.5		-4.6	-9.2	-4.6
R12	5	66.0	63.7	56.1		-2.3	-9.9	-7.6
	15	67.8	66.3	59.2		-1.5	-8.6	-7.1
	21	68.8	67.1	60.4		-1.7	-8.4	-6.7

Noise Level Summary

Minimum	*61.3*	*57.3*	*55.3*		*-8.6*	*-15.4*	*-10.6*
Maximum	*77.1*	*75.1*	*64.9*		*0.0*	*-5.0*	*-1.5*
Average	*68.3*	*65.0*	*59.6*		*-3.2*	*-8.7*	*-5.5*

Table 6
Peal Hour Leq Noise Level Mitigation and Design Option Comparison Analysis
SR-520 at 84th Avenue NE
Existing, Build w/o Mitigation, Build with Expanded Overpass and Build with Large Lid - (Build = 2020 6-Lane Alternative)

North Side of SR-520

		Future Conditions				Compare Existing with Build Conditions				Compare Different Mitigation & Design options				
Receiver	Existing	No Walls	With Walls	Small Lid	Big Lid	Fut-Ext	Walls-Ext	SL-Ext	BL-Ext	Walls-No	Small-No	Big-No	SL-Walls	BL-Walls
R-13	69.5	70.9	57.5	57.5	56.9	1.4	-12	-12	-12.6	-13.4	-13.4	-14	0	-0.6
R-14	66.8	68.2	57.9	57.9	56.7	1.4	-8.9	-8.9	-10.1	-10.3	-10.3	-11.5	0	-1.2
R-15	62.8	64.2	56	55.9	54.8	1.4	-6.8	-6.9	-8	-8.2	-8.3	-9.4	-0.1	-1.2
R-16	63	64.4	56.3	56.3	54.1	1.4	-6.7	-6.7	-8.9	-8.1	-8.1	-10.3	0	-2.2
R-17	61.5	62.9	55.7	55.6	54.1	1.4	-5.8	-5.9	-7.4	-7.2	-7.3	-8.8	-0.1	-1.6
R-18	66.5	66.6	58.6	58.2	56.3	0.1	-7.9	-8.3	-10.2	-8	-8.4	-10.3	-0.4	-2.3
R-19	67.6	68.5	66.5	66.5	62.5	0.9	-1.1	-1.1	-5.1	-2	-2	-6	0	-4
R-20	62.8	64.6	62.2	61.6	58.1	1.8	-0.6	-1.2	-4.7	-2.4	-3	-6.5	-0.6	-4.1
R-21	70.2	71.6	63.4	63	60.4	1.4	-6.8	-7.2	-9.8	-8.2	-8.6	-11.2	-0.4	-3
R-22	60.9	62.4	59.4	59.2	57.9	1.5	-1.5	-1.7	-3	-3	-3.2	-4.5	-0.2	-1.5
R-23	67.6	69	61	60.8	60	1.4	-6.6	-6.8	-7.6	-8	-8.2	-9	-0.2	-1
R-24	64.1	65.5	60.3	60.2	59.7	1.4	-3.8	-3.9	-4.4	-5.2	-5.3	-5.8	-0.1	-0.6
R-25	61.9	63.3	59	58.9	58.5	1.4	-2.9	-3	-3.4	-4.3	-4.4	-4.8	-0.1	-0.5
R-26	66.2	67.6	61.3	61.3	61.1	1.4	-4.9	-4.9	-5.1	-6.3	-6.3	-6.5	0	-0.2
R-27	62.5	63.9	60.8	60.7	60.4	1.4	-1.7	-1.8	-2.1	-3.1	-3.2	-3.5	-0.1	-0.4
Minimum	*60.9*	*62.4*	*55.7*	*55.6*	*54.1*	*0.1*	*-12.0*	*-12.0*	*-12.6*	*-13.4*	*-13.4*	*-14.0*	*-0.6*	*-4.1*
Maximum	*70.2*	*71.6*	*66.5*	*66.5*	*62.5*	*1.8*	*-0.6*	*-1.1*	*-2.1*	*-2.0*	*-2.0*	*-3.5*	*0.0*	*-0.2*
Average	*64.9*	*66.2*	*59.7*	*59.6*	*58.1*	*1.3*	*-5.2*	*-5.4*	*-6.8*	*-6.5*	*-6.7*	*-8.1*	*-0.2*	*-1.6*

South Side of SR-520

		Future Conditions				Compare Existing with Build Conditions				Compare Different Mitigation & Design options				
Receiver	Existing	No Walls	With Walls	Small Lid	Big Lid	Fut-Ext	Walls-Ext	SL-Ext	BL-Ext	Walls-No	Small-No	Big-No	SL-Walls	BL-Walls
R-28	63.8	65.2	56	55.8	55.1	1.4	-7.8	-8	-8.7	-9.2	-9.4	-10.1	-0.2	-0.9
R-29	67.9	69.3	58.3	58.2	57.6	1.4	-9.6	-9.7	-10.3	-11	-11.1	-11.7	-0.1	-0.7
R-30	65.8	67.2	55.1	54.9	54.1	1.4	-10.7	-10.9	-11.7	-12.1	-12.3	-13.1	-0.2	-1
R-31	62.8	64.2	54.3	54.1	53.3	1.4	-8.5	-8.7	-9.5	-9.9	-10.1	-10.9	-0.2	-1
R-32	69.9	71.3	57	56.7	54.6	1.4	-12.9	-13.2	-15.3	-14.3	-14.6	-16.7	-0.3	-2.4
R-33	63.2	64.5	56.7	56.5	55.1	1.3	-6.5	-6.7	-8.1	-7.8	-8	-9.4	-0.2	-1.6
R-34	70.1	71.5	60	59.4	56.9	1.4	-10.1	-10.7	-13.2	-11.5	-12.1	-14.6	-0.6	-3.1
R-35	64.4	65.7	61.9	61.4	61.1	1.3	-2.5	-3	-3.3	-3.8	-4.3	-4.6	-0.5	-0.8
R-36	68.8	72.6	62.7	62.6	61	3.8	-6.1	-6.2	-7.8	-9.9	-10	-11.6	-0.1	-1.7
R-37	64.1	67.8	57.4	57.2	55.2	3.7	-6.7	-6.9	-8.9	-10.4	-10.6	-12.6	-0.2	-2.2
R-38	71.8	73.1	61.9	61.4	59	1.3	-9.9	-10.4	-12.8	-11.2	-11.7	-14.1	-0.5	-2.9
R-39	66.6	70.4	62.2	62.2	61.4	3.8	-4.4	-4.4	-5.2	-8.2	-8.2	-9	0	-0.8
R-40	70.3	71.6	60.2	60.1	56.6	1.3	-10.1	-10.2	-13.7	-11.4	-11.5	-15	-0.1	-3.6
R-41	66.5	67.9	61.1	61	60	1.4	-5.4	-5.5	-6.5	-6.8	-6.9	-7.9	-0.1	-1.1
R-42	65.1	68.3	62.1	62.1	61.4	3.2	-3	-3	-3.7	-6.2	-6.2	-6.9	0	-0.7
R-43	64.6	65.9	61.8	61.7	60.9	1.3	-2.8	-2.9	-3.7	-4.1	-4.2	-5	-0.1	-0.9
R-44	71.1	72.5	62.2	62.2	61.5	1.4	-8.9	-8.9	-9.6	-10.3	-10.3	-11	0	-0.7
Minimum	*62.8*	*64.2*	*54.3*	*54.1*	*53.3*	*1.3*	*-12.9*	*-13.2*	*-15.3*	*-14.3*	*-14.6*	*-16.7*	*-0.6*	*-3.6*
Maximum	*71.8*	*73.1*	*62.7*	*62.6*	*61.5*	*3.8*	*-2.5*	*-2.9*	*-3.3*	*-3.8*	*-4.2*	*-4.6*	*0.0*	*-0.7*
Average	*67.0*	*69.0*	*59.8*	*59.6*	*58.1*	*2.0*	*-7.2*	*-7.4*	*-8.9*	*-9.2*	*-9.4*	*-10.8*	*-0.2*	*-1.6*

Notes: Red = Impact Black Bold = Reduction > 3 dBA Blue Bold = Reduction > 5dBA Green = Reduction > 7 dBA